# General notes

Q1 - Q4: All good questions, uncertain if grading scheme is equal across all versions of the test; some confusion on wording for Prob 2 (make explicit one unit increase)

Q5: All good, be explicit if want students to include interpretation and/or units though

Q6: (a) no students identified the residual plot for Mod 3 as superior, will see how this appears upon corrections. Some prefer Mod 1 because simpler but Mod 3 has slightly higher adj R-squared. May not be a good question to include credit for no incorrect statements because of subjectivity. Instead, specify at least two reasons why you'd choose one model (and adjust the data to make distinction more clear). Students want to use the fact that each individual predictors is significant even though this isn't supported in class or book.

(b) Good question, able to grade based on answer to 6a even if that wasn't correct

Q7: (a) is a good question but (b) needs work. At the very least, need to explain what "reliability" means. Adjust data to make distinction in residual plots more apparent (I initially ran out of time when preparing the test) Some students want to claim that reliability has to do with the size of the p-value.

Q8: This would be a good place to include credit for "no incorrect statements" (didn't think to do this when grading unfortunately), maybe up to 3 points worth; also next time specify at least three steps and explain how you'd use them/what you need to consider/compare

# Solutions and rubric

## For MC questions (Q1-Q4)

1. One correct answer
   1. 1 point for correct answer
   2. 1 point for no incorrect answers
2. Two correct answers
   1. 0.5 point for one correct answer
   2. 1 point for two correct answers
   3. 1 point for no incorrect answers
3. Three correct answers
   1. 0.5 points for one correct answer
   2. 1 point for two correct answers
   3. 1.5 points for three correct answers
   4. 0.5 points for no incorrect answers

Q1

1. All versions (a,d)

Q2

1. V1 (c)
2. V2 (b,c)
3. V3 (a,b)

Q3

1. V1 and V2 (b,c,d)
2. V3 (c)

Q4

1. V1 and V2 (a,b,d)
2. V3 (b,c,d)

## Q5

1. **Solution**: For either all smokers or all non-smokers, an increase in drink per day corresponds to average decrease of 3.27 years

**Rubric**: 1 point - Correct value; 1 point - Correct interpretation

1. **Solution**: 93.7 - (3.27 x 2.5) - 23.44

**Rubric**: 1 point - correct value (didn't deduct for no units)

1. **Solution**: Smokers live an average of 23.44 years less than non-smokers, controlling for same alcohol consumption

**Rubric**: 0.5 points for correct value/formula; 0.5 points for correct interpretation (which is smaller, not units)

1. **Solution**: Yes, pending assumptions, since TS=-11.77 with p-value approx 0, means controlling for effect of one predictor, the other has a significant impact on life expectancy

**Rubric**: 1 point - valid conclusion; 1 point - No incorrect statements

## Q6

1. **Solution**: Mod 3 because residuals have less curved pattern compared to other two and has largest adjusted R-squared and (as discussed in class) reasonable to include interaction term for weight and transmission type.

**Rubric**: 0.5 points - Identify Mod 3; 1 point - Valid reason(s) for model choice; 0.5 points - No incorrect statements

1. **Solution**: H0: \beta\_1 = \beta\_2 = \beta\_3 = 0, p-value 1.669e-12 (or may be different but still counted correct if chose Mod 1 in part (a) with H0: \beta\_1 = \beta\_2 = 0, p-value 1.795e-12)

**Rubric**: 1 point - Hypothesis is correct (consistent with answer to 6a); 1 point - Correct p-value for hypothesis; 1 point - Valid conclusion

## Q7

1. **Solution**: H0: \beta\_2 = \beta\_3 = 0

**Rubric**: 2 points - Correct null and alternative; 1 point - Partially correct null and/or alternative (just \beta\_2 or \beta\_3 in H0)

1. **Solution**: Both tests require "good" residuals for both full and reduced model. In 6b) the reduced model just uses the mean so it's less obvious that we need to check the distribution of the Y values. In 7a) however the reduced model is Mod 1 which a student may validly interpret as looking worse than resids in Mod 3 or may say there is not a big difference in the two so both tests are equally reliable.

**Rubric**: 2 points - Identify that reliability depends on assumptions (NO ONE realized this…); 1 point - Reasonable explanation (even if otherwise incorrect); 1 point - No incorrect statements (Difficult to assess this when students assume reliability = specificity)

## Q8

**Rubric**: 6 points - Three or more explicitly, valid (correct) steps;

5 points - Two valid steps with detailed explanations;

4 points - One valid step with detailed explanation;

4 points - Three or more valid steps but not explicit;

2 points - One valid step with insufficient/incorrect explanation